**Foundations 11 Learning Objectives**

**Logical Reasoning 9 Days**

1. **Analyze and prove conjectures using logical reasoning, to solve problems.**

* Make conjectures by observing patterns and identifying properties, and justify the reasoning.
* Explain why logical reasoning may lead to a false conjecture.
* Compare, using examples, inductive and deductive reasoning.
* Provide and explain a counter example to disprove a given conjecture.
* Prove algebraic and number relationships, such as divisibility rules, number properties, mental mathematics strategies or algebraic number tricks.
* Prove a conjecture, using deductive reasoning (not limited to two column proofs).
* Determine if a given argument is valid, and justify the reasoning.
* Identify errors in a given proof; e.g., a proof that ends with.
* Solve a contextual problem involving inductive or deductive reasoning.

1. **Analyze puzzles and games that involve numerical reasoning, using problem solving strategies.**

* Determine, explain and verify a strategy to solve a puzzle or to win a game such as: - guess and check - look for a pattern - make a systematic list - draw or model - eliminate possibilities - simplify the original problem - work backward - develop alternative approaches.
* Develop alternative approaches to solving puzzles.
* Identify and correct errors in a solution to a puzzle or in a strategy for winning a game.
* Create a variation on a puzzle or a game, and describe a strategy for solving the puzzle or winning the game.

**Geometry 27 Days**

1. **Derive proofs that involve the properties of angles and triangles.**

* Generalize, using inductive reasoning, the relationships between pairs of angles formed by transversals and parallel lines, with or without technology.
* Prove, using deductive reasoning, properties of angles formed by transversals and parallel lines, including the sum of the angles in a triangle.
* Prove, using deductive reasoning, relationships between sides and/or angles using congruent triangle properties.
* Generalize, using inductive reasoning, a rule for the relationship between the sum of the interior angles and the number of sides (n) in a polygon, with or without technology.
* Identify and correct errors in a given proof of a property involving angles and/or congruent triangles.
* Verify, with examples, that if lines are not parallel, the angle properties do not apply.

1. **Solve problems that involve the properties of angles and triangles.**

* Determine the measures of angles in a diagram that involves parallel lines, angles and triangles, and justify the reasoning.
* Identify and correct errors in a given solution to a problem that involves the measures of angles.
* Solve a contextual problem that involves angles or triangles.
* Construct parallel lines, using only a compass or a protractor, and explain the strategy used.
* Determine if lines are parallel, given the measure of an angle at each intersection formed by the lines and a transversal.

1. **Solve problems that involve the cosine law and the sine law, including the ambiguous case.**

* Draw a diagram to represent a problem that involves the cosine law or sine law.
* Explain the steps in a given proof of the sine law or cosine law.
* Solve a problem involving the cosine law that requires the manipulation of the formula.
* Explain, concretely, pictorially or symbolically, whether zero, one or two triangles exist, given the SSA situation. (side, side, angle)
* Solve a problem involving the sine law that requires the manipulation of the formula.
* Solve a contextual problem that involves the cosine law or the sine law.

**Relations and Functions 18 Days**

1. **Model and solve problems that involve systems of linear inequalities in two variables.**

* Graph, justifying the choice of a solid or broken line, and explain the solution region that satisfies a linear inequality, using a test point when given a boundary line.
* Model a problem, using a system of linear inequalities in two variables.
* Graph the boundary line between two half planes for each inequality in a system of linear inequalities.
* Determine, graphically, the solution region for a system of linear inequalities, and verify the solution.
* Explain, using examples, the significance of the shaded region in the graphical solution of a system of linear inequalities.
* After in-class demonstration, solve linear optimization problems.

1. **Demonstrate an understanding of the characteristics of quadratic functions, including: vertex, intercepts, domain and range, axis of symmetry.**

* Determine, with or without technology, the intercepts of the graph of a quadratic function.
* Determine, by factoring, the roots of a quadratic equation, and verify by substitution. Limit factoring methods to: removing the common factor, factoring by inspection, modeling with algebra tiles, identifying perfect squares, identifying difference of squares, and partial factoring.
* Determine, using the quadratic formula, the roots of a quadratic equation.
* Explain the relationships among the roots of an equation, the zeros of the corresponding function, and the -intercepts of the graph of the function.
* Explain, using examples, why the graph of a quadratic function may have zero, one or two -intercepts.
* Express a quadratic equation in factored form, using the zeros of a corresponding function or the -intercepts of its graph.
* Determine, with or without technology, the coordinates of the vertex of the graph of a quadratic function.
* Determine the equation of the axis of symmetry of the graph of a quadratic function, given the -intercepts of the graph.
* Determine the coordinates of the vertex of the graph of a quadratic function, given the equation of the function and the axis of symmetry, and determine if the -coordinate of the vertex is a maximum or a minimum.
* Determine the domain and range of a quadratic function.
* Sketch the graph of a quadratic function.
* Solve a contextual problem that involves the characteristics of a quadratic function.

**Financial Number Sense 18 Days**

1. **Analyze costs and benefits of renting, leasing and buying.**

* Identify and describe examples of assets that appreciate or depreciate.
* Compare, using examples, renting, leasing and buying.
* Justify, for a specific set of circumstances, if renting, buying or leasing would be advantageous.
* Solve a problem involving renting, leasing or buying that requires the manipulation of a formula.
* Solve, using technology, a contextual problem that involves cost-and-benefit analysis.

1. **Analyze an investment portfolio in terms of: interest rate, rate of return, total return.**

* Determine and compare the strengths and weaknesses of two or more portfolios.
* Determine, using technology, the total value of an investment when there are regular contributions to the principal.
* Graph and compare the total value of an investment with and without regular contributions.
* Apply the Rule of 72 to solve investment problems, and explain the limitations of the rule.
* Determine, using technology, possible investment strategies to achieve a financial goal.
* Explain the advantages and disadvantages of long-term and short-term investment options.
* Explain, using examples, why smaller investments over a longer term may be better than larger investments over a shorter term.
* Solve an investment problem

1. **Solve problems that involve personal budgets.**

* Identify income and expenses that should be included in a personal budget.
* Explain considerations that must be made when developing a budget; For example, prioritizing, recurring and unexpected expenses.
* Create a personal budget based on given income and expense data.
* Collect income and expense data, and create a budget.
* Modify a budget to achieve a set of personal goals.
* Investigate and analyze, with or without technology, “what if …” questions related to personal budgets.